

**What is claimed is:**

- 1        1. A discharge lamp circuit for ignition time control  
2 and overvoltage protection, comprising:
  - 3        drive circuitry for producing a strike voltage for a  
4        discharge lamp and providing a lamp current  
5        through the discharge lamp;
  - 6        a sensing circuit for detecting the lamp current;
  - 7        a timing circuit, controlled by the sensing circuit,  
8        for developing a threshold voltage at the end of  
9        a predetermined period, thereby controlling an  
10      ignition time of the drive circuitry; and
  - 11      a start-up circuit for allowing the drive circuitry to  
12      keep on applying the strike voltage for the  
13      ignition time in order to start the discharge  
14      lamp before the threshold voltage is developed,  
15      and for causing the drive circuitry shutdown if  
16      the sensing circuit detects the absence of the  
17      lamp current.
- 1        2. The discharge lamp circuit as recited in claim 1,  
2 wherein the timing circuit comprises a capacitor coupled to  
3 a resistor at a node where a node voltage is developed, in  
4 which the predetermined period is determined by the  
5 capacitor's value and the resistor's value and the node  
6 voltage reaches the threshold voltage at the end of the  
7 predetermined period.
- 1        3. The discharge lamp circuit as recited in claim 2  
2 wherein the start-up circuit comprises a first switch

3 coupled to the node of the timing circuit, receiving an  
4 input signal, and generating a start signal at a first level  
5 to activate the drive circuitry when a voltage difference  
6 between the input signal and the node voltage is sufficient  
7 to turn on the first switch.

1       4. The discharge lamp circuit as recited in claim 3  
2 wherein the sensing circuit comprises a second switch  
3 coupled to the capacitor, when the sensing circuit detects  
4 the presence of the lamp current, the second switch is  
5 turned on to discharge the capacitor.

1       5. The discharge lamp circuit as recited in claim 4  
2 wherein the second switch is turned off when the sensing  
3 circuit detects the absence of the lamp current, thereby  
4 allowing the capacitor to be charged so that the node  
5 voltage reaches the threshold voltage at the end of a  
6 predetermined period.

1       6. The discharge lamp circuit as recited in claim 5  
2 wherein the start-up circuit generates the start signal at a  
3 second level to shut down the drive circuitry when the  
4 second switch is turned off, causing the first switch to be  
5 turned off.

1       7. The discharge lamp circuit as recited in claim 6  
2 wherein the start-up circuit further comprises a third  
3 switch coupled to the capacitor, for discharging the  
4 capacitor quickly upon the drive circuitry shutdown.

1       8. A discharge lamp circuit for ignition time control  
2 and overvoltage protection, comprising:

3        drive circuitry for producing a strike voltage for a  
4                discharge lamp and providing a lamp current  
5                through the discharge lamp;  
6        a sensing circuit coupled to the discharge lamp, for  
7                detecting the lamp current;  
8        a timing circuit for developing a threshold voltage at  
9                the end of a predetermined period, comprising:  
10                a resistor; and  
11                a capacitor coupled to the sensing circuit and  
12                coupled to the resistor at a node where a  
13                node voltage is developed;  
14                wherein the node voltage reaches the threshold  
15                voltage at the end of the predetermined  
16                period determined by the capacitor's value  
17                and the resistor's value, thereby  
18                controlling an ignition time of the drive  
19                circuitry; and  
20        a start-up circuit comprising a first transistor  
21                coupled to the node of the timing circuit,  
22                wherein the first transistor is in a first state  
23                before the node voltage is developed into the  
24                threshold voltage thereby allowing the drive  
25                circuitry to keep on applying the strike voltage  
26                for the ignition time in order to start the  
27                discharge lamp, and the first transistor is in a  
28                second state when the sensing circuit detects the  
29                absence of the lamp current and the threshold  
30                voltage is developed at the end of the  
31                predetermined period.

1        9. The discharge lamp circuit as recited in claim 8  
2 wherein the start-up circuit receives an input signal and  
3 generates a start signal at a first level to activate the  
4 drive circuitry when a voltage difference between the input  
5 signal and the node voltage is sufficient to drive the first  
6 transistor into the first state.

1        10. The discharge lamp circuit as recited in claim 9  
2 wherein the sensing circuit comprises a second transistor  
3 coupled to the capacitor, when the sensing circuit detects  
4 the presence of the lamp current, the second transistor  
5 being in the first state to discharge the capacitor.

1        11. The discharge lamp circuit as recited in claim 10  
2 wherein the second transistor enters the second state when  
3 the sensing circuit detects the absence of the lamp current,  
4 thereby allowing the capacitor to be charged so that the  
5 node voltage reaches the threshold voltage at the end of a  
6 predetermined period.

1        12. The discharge lamp circuit as recited in claim 11  
2 wherein the start-up circuit generates the start signal at a  
3 second level to shut down the drive circuitry when the  
4 voltage difference drives the first transistor into the  
5 second state for the second transistor being in the second  
6 state.

1        13. The discharge lamp circuit as recited in claim 12  
2 wherein the start-up circuit further comprises a third  
3 transistor coupled to the capacitor, for discharging the  
4 capacitor quickly upon the drive circuitry shutdown.

1        15. The display as recited in claim 14, wherein the  
2 timing circuit comprises a capacitor coupled to a resistor  
3 at a node where a node voltage is developed, in which the  
4 predetermined period is determined by the capacitor's value  
5 and the resistor's value and the node voltage reaches the  
6 threshold voltage at the end of the predetermined period.

1        16. The display as recited in claim 15 wherein the  
2 start-up circuit comprises a first switch coupled to the  
3 node of the timing circuit, receiving an input signal, and  
4 generating a start signal at a first level to activate the  
5 drive circuitry when a voltage difference between the input  
6 signal and the node voltage is sufficient to turn on the  
7 first switch.

1        17. The display as recited in claim 16 wherein the  
2 sensing circuit comprises a second switch coupled to the  
3 capacitor, when the sensing circuit detects the presence of  
4 the lamp current, the second switch is turned on to  
5 discharge the capacitor.

1        18. The display as recited in claim 17 wherein the  
2 second switch is turned off when the sensing circuit detects  
3 the absence of the lamp current, thereby allowing the  
4 capacitor to be charged so that the node voltage reaches the  
5 threshold voltage at the end of a predetermined period.

1        19. The display as recited in claim 18 wherein the  
2 start-up circuit generates the start signal at a second  
3 level to shut down the drive circuitry when the second  
4 switch is turned off, causing the voltage difference to turn  
5 off the first switch.

1        20. The display as recited in claim 19 wherein the  
2 start-up circuit further comprises a third switch coupled to  
3 the capacitor, for discharging the capacitor quickly upon  
4 the drive circuitry shutdown.